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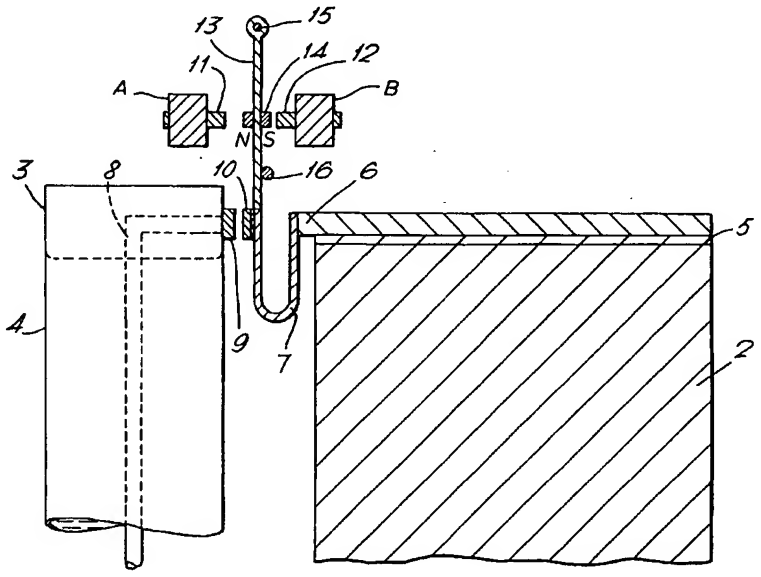
(54) Title: VOLATILE MATERIAL DISPENSER



(57) Abstract: A dispenser comprising a liquid reservoir (3) for supplying a volatile liquid to a dispersal element (2) having a surface from which the liquid is dispersed to the surrounding atmosphere. A liquid conduit (8) extends from the reservoir (3) to the dispersal element (2) comprising a link (7) that is displaceable to interrupt the flow from the reservoir (3) to the dispersal element (2). Electrical drive means are provided for controlling the link (7) to displace it between positions opening and closing a liquid path through the conduit from the reservoir (3) to the dispersal element (2).

WO 01/66158 A1

VOLATILE MATERIAL DISPENSER

This invention relates to dispensers for volatile materials in liquid form, in particular for releasing such materials into a surrounding atmosphere in a controllable manner.

Dispensers are known which have a reservoir of the fluid to be dispensed held in an essentially closed vessel but having a wick for drawing the liquid out of the vessel by capillary action, the wick itself serving as a dispersing element or being connected to another element of larger surface area which will itself disperse the volatile liquid more readily into the atmosphere.

In the known dispensers the dispersal of the liquid can only be controlled in a relatively limited manner, however, for example by providing a lid or cap that the user can close when no further material is to be released.

According to the present invention, there is provided a dispenser comprising a liquid reservoir for supplying a volatile liquid to a dispersal element having a surface from which the liquid is dispersed to the surrounding atmosphere, a liquid conduit from the reservoir to the dispersal element comprising a link that is displaceable to interrupt the flow from the reservoir to the dispersal element, and electrical drive means for controlling said link to displace it between positions opening and closing a liquid path through said conduit

from the reservoir to the dispersal element.

The electrical control means preferably comprises latch means for retaining the link in each of said two positions selectively, and powered drive means for switching the link between said positions. It can thus be arranged that an energy input will be required only for switching the link between its alternative positions while the latching means, which may comprise magnetic elements, can be arranged to hold the link in the position to which it has been switched.

In a preferred form of the invention, the link comprises a permanent magnet to which a portion of said conduit is attached, the magnet lying between and movable towards and away from either of a pair of opposed magnetisable elements each provided with electromagnetic energising means, such as a conductive coil, the magnet having opposite poles directed towards the respective elements and the energising means being arranged to magnetise said elements to move the permanent magnet towards one of the elements selectively, in order to open and close said liquid path.

In one such arrangement, the energising means may be arranged to magnetise the ends of the elements nearer the magnet with the same polarity, so urging the magnet towards one element but away from the other, but being operable to reverse said poles of the elements, whereby the magnet can be moved towards one or other of the elements selectively. By placing the magnet between a

pair of opposed magnetisable elements, so that it can be attracted towards either selectively, the fluid path can then be switched between opened and closed positions requiring an energy input only for the switching step. When the required position has been reached, it can be maintained passively by the attraction between the magnet and element towards which it has been displaced.

The link may comprise a flexible portion of the conduit that is displaceable to connect with or be disconnected from a contiguous portion of the conduit to close or open the liquid path. Preferably at least the liquid supply side of said connection is formed by a member through which the liquid flows by capillary action.

In a preferred form of dispenser, the flow onto the dispersal element relies on a syphon effect, the element itself taking the form of a generally laminar surface extending downwardly from said conduit which comprises capillary means for drawing the liquid from a lower level to the top of the laminar element.

By employing capillary action for flow through the fluid conduit, a self-priming effect can be obtained for the rising portion of the syphon path. Preferably the link is placed at or adjacent the top of the syphon path, in particular so as to ensure that liquid does not continue to feed through by gravity from the supply side when the link is opened.

By employing a generally laminar screen as the

dispersal element, it is possible to provide a relatively low bulk element with a large surface area for rapid dispersal of the liquid to the atmosphere. For such a dispersal screen to give its best performance, the rate of supply of the liquid to the screen should be related to the rate at which the liquid disperses from the screen. If it becomes overloaded with liquid, the lower region of the screen can become flooded and the rate of dispersal may then be reduced. In addition, when the liquid is a mixture of components with different volatilities, the rate at which these components are dispersed can become skewed, when the retention of less volatile components impedes the replenishment of the more volatile components escaping from the screen.

In a dispenser according to the invention, the control of the displaceable link to interrupt the supply to the screen can be arranged to minimise the occurrence of flooding. For instance, a timer may be used to control the displacement of the link to interrupt the supply to the screen at regular intervals.

It is also desirable for the control, in particular the duration of the periods in which the liquid path through said conduit from the reservoir to the dispersal element is open, to have some dependence on the ambient temperature in which the device is operating. This is because the rate at which the volatile liquid disperses from the screen will itself be dependent on this ambient temperature. If the temperature is low, the

liquid will disperse less quickly, and the screen will be more prone to flooding in the lower region. By reducing the rate of supply of the liquid to the screen in low ambient temperature conditions, the risk of flooding can be minimised.

The invention will be further described by way of example with reference to the accompanying diagrammatic drawing which illustrates the liquid supply conduit, and its link operating mechanism, in a volatile liquid dispenser according to the invention.

The dispenser has a liquid reservoir 3 from the bottom of which an outlet tube 8 extends to a top outlet above the liquid level in the reservoir the outlet terminating with a capillary pad 9. Beside the reservoir is a laminar dispersal screen 2 which depends from a hollow supply bar 6 at the same level as the top outlet. Between the top outlet and the supply bar 6 is a link 7, shown spaced from the top outlet but displaceable to bring a capillary contact pad 10 on its entry end into abutment with the pad 9 at the top outlet.

The outlet tube 8 is filled with a wick which extends to the outlet capillary pad (which may be integral with the wick). The U-shaped link 7 is made of a flexible capillary material, like its contact pad 9, and the supply bar similarly contains a wick. The supply bar wick is in contact with the top of the screen 2 so that liquid can form by gravity from the wick down the screen 2. The outlet tube wick, the link and the supply

bar wick thus form a conduit providing a capillary path drawing liquid from the reservoir 3 to the screen 2, the rate of flow along that path being dependent on the syphon action created as the liquid flows down the screen 2.

The link 7 is suspended by an arm 13 from a fixed top pivot 15. In the open position of the link 7 shown, the arm 13 abuts against a fixed stop 16. The arm carries a permanent bar magnet 14, the opposite poles of which are directed towards respective soft iron cores 11,12 to opposite sides of the arm 13. Each core 11,12 is located within an electrical coil A,B, the two coils being connected in series to be energizable jointly. The coils A,B are so wound that the ends of both cores 11,12 facing the magnet 14 are given the same polarity when the coils A,B are energized. Depending upon the current direction through the coils A,B, therefore, the N and S poles of the magnet 14 will be between two poles of the cores 11,12 that are either both N or both S. By the combined forces of magnetic attraction and repulsion the magnet 14, and thus the arm 13, is driven in one direction or the other. Only a momentary current pulse is required because once the arm 13 has been displaced the magnet 14 will remain attracted to the closer core 11,12.

The illustrated example shows the S pole of the magnet 14 attracted to its adjacent core 12 and so holding the link 7 open until a further current pulse

through the coils A,B to change polarity gives the ends of the cores 11,12 facing the magnet S poles. The magnet 14 then pulls the arm 13 leftwards until the pads 9,10 come into contact and the pads 9,10 are held firmly in contact by the force of the magnet 14 until a further reversing current pulse.

In both positions, the magnet 14 is held spaced from the cores, whether by the stop 16 or the pads 9,10. The total amount of movement required may be no more than 1-2 mm as any clear gap between the pads 9,10 is sufficient to interrupt the flow through the conduit.

In operation, the cut-off of the liquid flow through the conduit is essentially instantaneous because the link 7 is located at the highest point of the liquid path so that there is no hydrostatic head acting that could force a bleed of fluid from the outlet pad 9 when the contact is opened.

The circuit in which the coils A,B operate is not shown but it can be capable of a variety of control modes. For example, it can produce intermittent operation with variable on and off periods to vary the amount of liquid released over a period of time. It can be clock-controlled, or have a light-sensitive element so that the liquid flow is stopped during darkness. Particularly when the device is to be used with liquids of high volatility, whose rate of dispersal from the screen is highly dependent on the ambient temperature in which the device is working, the control circuit

preferably includes a temperature-sensitive element, whereby the durations of the on and off periods can be made temperature dependent. Specifically, in colder environments the liquid will disperse less rapidly and the tendency will be for more liquid to collect towards the bottom of the screen, eventually resulting in flooding. To avoid this, the duration of the off periods can be increased and/or the duration of the on periods can be decreased. Conversely, where the device is operating in a relatively high temperature shorter off and/or longer on periods may be appropriate. However, other factors may then dominate the control of the liquid supply rate, for instance the desire not to overload the surrounding atmosphere with the dispersed liquid, which may for example be a fragrance.

It is also possible to incorporate a moisture-sensitive switch at the lower region of the screen 2 so as to prevent saturation of the screen 2 by the liquid being dispensed. These various modes of operation can be employed in conjunction with a fan which is switched on and off in dependence upon the supply of liquid to the screen 2 to assist dispersal from the screen.

The dispenser according to the invention is particularly suitable for use with ventilation apparatus that incorporates time controls or the like which typically rely on electronic controllers. It is common to use proprietary multi-channel controllers which may have spare channels, in which case the control of the

release of a volatile liquid using electrical drive means according to the invention can be achieved in a particularly cost-effective manner.

The screen 2 may be made of a variety of materials but particularly preferred is an open weft-warp fabric of polymer fibres, eg. polyester, of which at least the downwardly extending threads comprise capillary passages. The use of an open weave assists the circulation of air around the threads, assisting the release of the volatile material. The open weave also means that the fabric has a relatively low bulk for a given area, so that the amount of liquid on the screen 2 at any instant is limited and its release can be better controlled.

CLAIMS

1. A dispenser comprising a liquid reservoir for supplying a volatile liquid to a dispersal element having a surface from which the liquid is dispersed to the surrounding atmosphere, a liquid conduit from the reservoir to the dispersal element comprising a link that is displaceable to interrupt the flow from the reservoir to the dispersal element, and electrical drive means for controlling said link to displace it between positions opening and closing a liquid path through said conduit from the reservoir to the dispersal element.

2. A dispenser according to claim 1 wherein the electrical control means comprises latch means for retaining the link in each of said two positions selectively, and powered drive means for switching the link between said positions.

3. A dispenser according to claim 2 wherein the link comprises a permanent magnet to which a portion of said conduit is attached, the magnet lying between and movable towards and away from either of a pair of opposed magnetisable elements each provided with electromagnetic energising means, the magnet having opposite poles directed towards the respective elements and the energising means being arranged to magnetise said elements to move the permanent magnet towards one of the

elements selectively, in order to open and close said liquid path.

4. A dispenser according to claim 3 wherein the energising means are arranged to magnetise the ends of the elements nearer the magnet with the same polarity, so urging the magnet towards one element but away from the other, but being operable to reverse said poles of the elements, whereby the magnet can be moved towards one or other of the elements selectively.

5. A dispenser according to any one of the preceding claims wherein the link comprises a flexible portion of the conduit that is displaceable to connect with or be disconnected from a contiguous portion of the conduit to close or open the liquid path.

6. A dispenser according to claim 5 wherein at least the liquid supply side of said connection is formed by a member through which the liquid flows by capillary action.

7. A dispenser according to claim 7 wherein the conduit provides a capillary supply path along substantially its entire length.

8. A dispenser according to any one of the preceding claims wherein the conduit extends above the reservoir

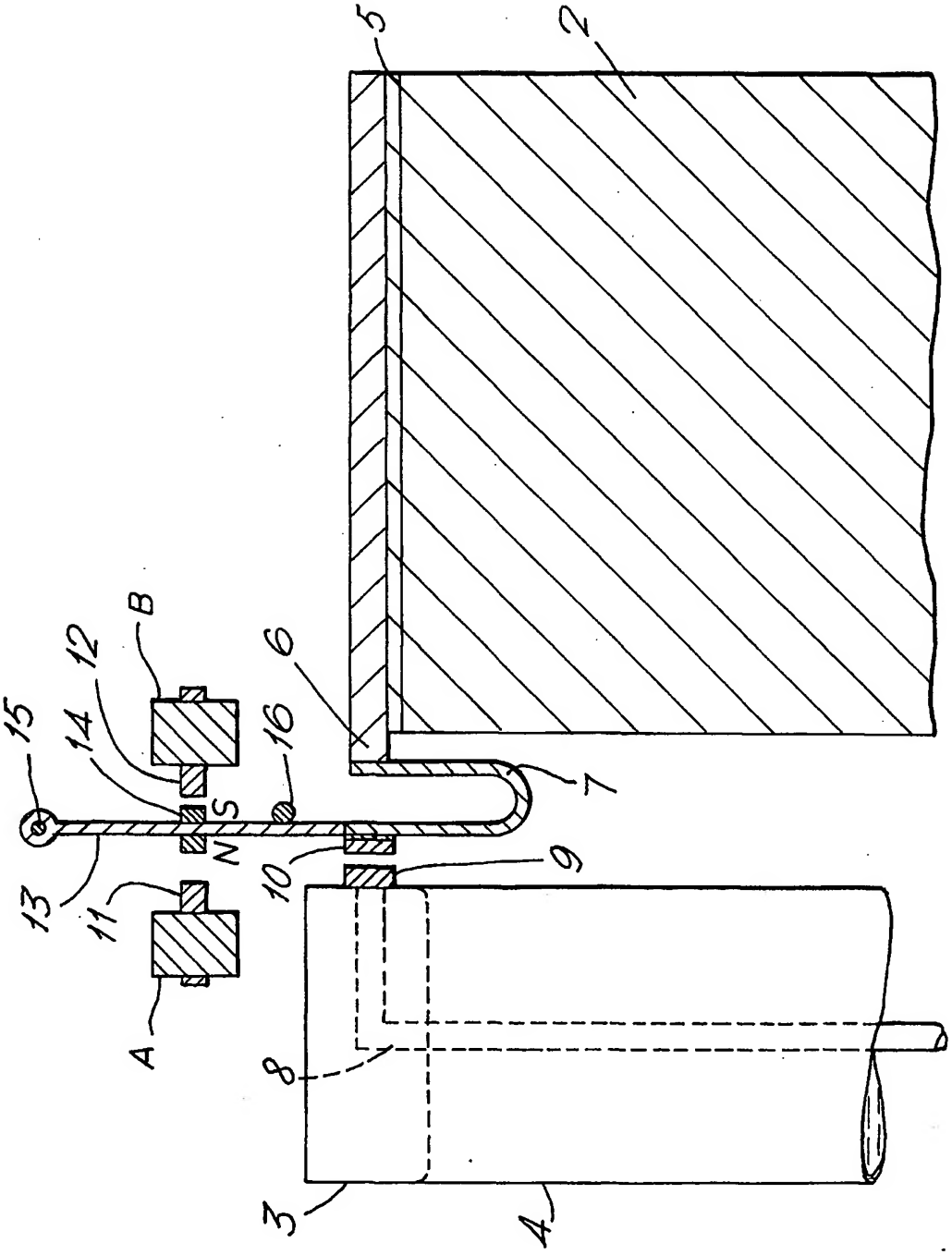
liquid level and the dispersal element, said element extending downwardly away from its fluid connection with the conduit, whereby the flow onto the dispersal element employs a syphon effect.

9. A dispenser according to claim 8 wherein the link is placed at or adjacent the top of the syphon path.

10. A dispenser according to any one of the preceding claims having a dispersal element in the form of at least one generally laminar screen extending downwards from its connection with the conduit.

11. A dispenser according to claim 10 wherein the screen is composed of an open weave material.

12. A dispenser according to any one of the preceding claims wherein control means for said electrical drive means comprises a timer device and/or a light-sensitive device and/or a moisture-sensitive device and/or a temperature-sensitive device.



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61L9/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 5 857 620 A (NAKONECZNY JOHN) 12 January 1999 (1999-01-12) column 2, line 16 -column 3, line 35; figures 1,2	1-12

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
14 May 2001	18/05/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Edmueller, P

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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